[3.0070]

A METHOD OF TAGGING LARGE AQUATIC BEETLES[1]

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Ecological studies of the desert pupfish, *Cyprinodon nevadensis* (Deacon, 1968), at Saratoga Springs, Death Valley National Monument, have led to ecological-ethological work on two similar species of predaceous diving beetles, *Cybister explanatus* LeC. and *C. ellipticus* LeC. Investigations of mating behavior, trophic ecology, and activity patterns led us to initiate a search for a suitable marking technique, enabling us to differentiate between males and females as well as between the species. A visible tag was practical since the water in one of the two habitats is remarkably clear, enabling observations under field conditions. Previous experience by the senior author in tagging flies (Murvosh and Thaggard, 1966), and a literature search suggested that an acceptable method was lacking. The following procedures were tried: 1) Painting dots on the elytra; 2) Spraying fluorescent paint; 3) Tying colored thread to the beetles, and 4) Applying dots of colored tape to the elytra.

Painting dots with various inks and paints was unsatisfactory except for limited success with Testors Dope applied with a toothpick or capillary tube. Dots begin to peel off after a couple of days and may be seen for up to a week. A method used in tagging fish (Jackson, 1959), with dry fluorescent pigments applied by compressed air, proved to be unsatisfactory, as the pigment did not penetrate the elytra as expected, adhering only to tarsal hairs. This method is expensive, difficult to apply, visible only under U-V light, and short lived (3-4 days).

An attempt was made to census the beetle population at Saratoga Springs by a tag, release, recapture procedure. One hundred adults were released after tying a short length of very brightly colored thread through a pinhole at the edge of an elytron. This marker lasted about a month in laboratory aquaria

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but none of the field marked beetles were ever recaptured or sighted.

A more promising technique is the "Tape Dot" method in which tiny dots of colored tape are applied to the elytra. A dot about four mm in diameter was punched out of a roll of colored tape using a paper punch. The punched dot was picked up at the very extreme edge with the sharp tips of jewelers forceps and applied to the dry surface of an elytron. This method is tedious and time consuming and the dot must be applied correctly or it may flake off in a few days. Dots must be punched free of frayed edges and with as little disturbance to the adhesive as possible.

Several different tapes were tried. Scotch plastic tape was used with some success in preliminary studies, but most dots peeled off after a month in laboratory aquaria. We finally selected Time Laboratory Tape[3] after vigorous tests in aquaria. Dense cover (*Phragmites* sp. and *Ceratophyllum* sp.) and rocks in the aquaria provided surfaces which came in contact with the tape marker on the dorsum of the beetles. Longevity of the Time tape exceeded two months under these conditions. Preliminary field studies suggest that the method is also applicable under natural conditions. Tagged beetles were recovered in the field after four weeks and preliminary census and sex ratio data obtained using 50 marked beetles. Studies are in progress and another attempt will be made to census the population in one of the habitats at Saratoga Springs.

Individual beetles may be identified by varying the size and/or shape, location, number, and color of the dots on the beetles. The large size (30 mm) of the beetles is a boone to this technique. Time tape dots also were applied successfully to the large (40 mm) hydrophilid *Hydrophilus triangularis*, but was of little value when a half dot was placed on the elytra of the smaller (10 mm) *Tropisternus obscurus.*

Insect tagging techniques often work well for one investigator but poorly for another. This procedure, properly used, may prove of value for other workers. We have not tagged any terrestrial insects but the method seems applicable to that area.

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Literature cited

Deacon, James E. 1968. The ecology of Sarotoga Springs, Death Valley National Monument. Report to the National Park Service 1968 (PP1-82).

Jackson, C. F. 1959. A technique for mass marking fish by means of compressed air. New Hampshire Fish and Game Dept., Tech. Circ. 17, 8 pp.

[3]Professional Tape Co., Burlington Road, Riverside, IL 60546.

Murvosh, C. M. and C. W. Taggard. 1966. Ecological studies of the house fly. Ann Ent. Soc. America, 59(3):533-547.

2.0070. A method of tagging large aquatic beetles. Abstract.–Two dytiscids, *Cybister explanatus* and *C. ellipticus* were successfully marked in laboratory and field studies using a "Tape Dot" technique. Small dots of colored tape were punched from a roll of Time Laboratory Tape and put on the dry elytra of the beetles. Individual beetles were identified by altering the size, color, shape, and location of the dots.–**Chad M. Murvosh** and **Bruce W. Miller**, *Department of Biological Sciences, University of Nevada, Las Vegas, NV 89109.*

Descriptors: aquatic beetles; Coleoptera; *Cybister spp.;* marking technique.

(The Entomologists' Record, *continued from p. 252.)*

3.0061 Collecting slime flux feeding Coleoptera in Japan.–Sappy wounds of injured or diseased trees entice a wide variety of insects. Carter (1945) stated that when fluxing is prolific or long continued, air-borne bacteria, yeasts, and fungi contaminate the oozing sap, ferment it and produce the material called slime flux. Apparently the oozing flux is toxic to the flux site and so prevents callusing by the tree. Consequently, the same tree usually can be a good collecting site for insects from year to year.

My stay in Japan spanned four years, and collecting at flux sites was one of the most fruitful areas of endeavor. As soon as the vascular system of a tree became active in the spring the slime flux began to ooze out and attract insects. The best trees to visit were usually elms which possibly suffered from wetwood. April and May saw only a few insects feeding at the trees in the Tokyo area, but their numbers and kind greatly increased in June, July, and August; an abrupt decline in insect activity occurred in September.

During the day in the prime months, numerous species of nymphalid butterflies could be encountered and easily captured (species of *Hestina, Kaniska, Nymphalis, Vanessa, Polygonia, Neope*). Flies, wasps, and occasionally slugs were seen also feeding in very close proximity to one another and in apparent harmony. Only a new arrival or departure would send a nervous twitch through the group.

Beetles, however, were the most prevalent visitors to the sap flows. Nitidulids (*Librodor japonicus* Motschulsky) were always to be found buried in the slime flux or hiding in adjacent cracks and crevices. Helotids *(Helota gemmata* Gorham) were seen less commonly but were usually in the same surroundings as the nitidulids. Scarabs, especially the Cetoniinae (*Protaetia orientalis* Gory and Percheron, *Rhomborrhina japonica* Hope, *R. polita* Waterhouse) were very abundant during the day. The cetonines invariably kept to the higher or tree-top feeding areas and only rarely visited a lower flux site. An extendable 15 ft. net was an essential piece of equipment and enabled one to catch 20-30 of these swirling insects in one sweep. During the first two years of collecting, the rhinoceros beetle (*Allomyrina dichotoma* L.) could be found during the day, but after the second year they could be observed only at night.

Insect activity at the flux sites increased sharply with the advent of darkness. Wood roaches, long-horned grasshoppers and a variety of moths made their appearance. Carabids (*Damaster blaptoides* Koller, *Nebria* sp.) would venture near the sap flows, and the nitidulids and helotids remained active. Curculionids (*Ectatorrhinus adamsi* Pascoe, *Hylobius abietis* L.) occurred in considerable numbers on three or four trees in one very localized area. The most frequently encountered beetles, however, were the elaterids, lucanids, scarabs, and cerambycids.

The elaterids *Tetrigus lewsi* Candèze, *Spheniscosomus cete* Candèze, *Stenagostus umbratilis* Lewis, *Melanotus legatus* Candèze, and *Selatosomus onerosus* Lewis were collected with ease, there normally being several individuals at each of the 20 or so collecting trees.

Lucanids were very abundant and seemed to be climbing about nearly everywhere; it was not uncommon to see 10-20 individuals on just one flux site. Species taken were *Psalidoremus inclinatus* Motschulsky, *P. inclinatus* var. *inflexus* Harold, *Serrognathus titanus* Saunders, and *Macrodorcas rectus* Motschulsky. The beam of a flashlight would cause a number of them to start and maintain an alert or defensive posture while others, seemingly oblivious to the light, continued lapping up the flux. Even though all the individuals on a tree might be collected, returning a half hour later would reveal a host of replacements feeding at the flow.

Like the stag beetles, the rhinoceros beetle (*A. dichotoma* L.) came to feed at the flux sites in numbers, often flying in with a heavy droning of great wings, their eyes glowing in the flashlight beam like orange embers. Collecting 50 of these beetles a night was not an unreasonable goal. Another dynastine, *Eophileurus chinensis* Faldermann, was taken on less numerous occasions.

Among the cerambycids, *Mallambyx raddei* Blessig fed at the flow sites frequently as did the highly elusive, beautifully green *Chloridolum japonicum* Harold. The latter were wary and would rapidly run up the tree within a matter of seconds after a light was shown.

The optimum time for night collecting began at about 8:30 PM and lasted until about 2 AM. The majority of the beetles had retired after this time, leaving the slime flux to the moths and roaches. This method of collecting was a continual source of excellent material and personal pleasure because one never knew what new and unexpected creature could be waiting on the next tree.

Literature cited: Carter, J. C. 1945. Wetwood of elms. Bull. Illinois Nat. Hist. Survey, 23: 407-448.—**Brett C. Ratcliffe,** *2231 Griffith, Lincoln, NB 68503*

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